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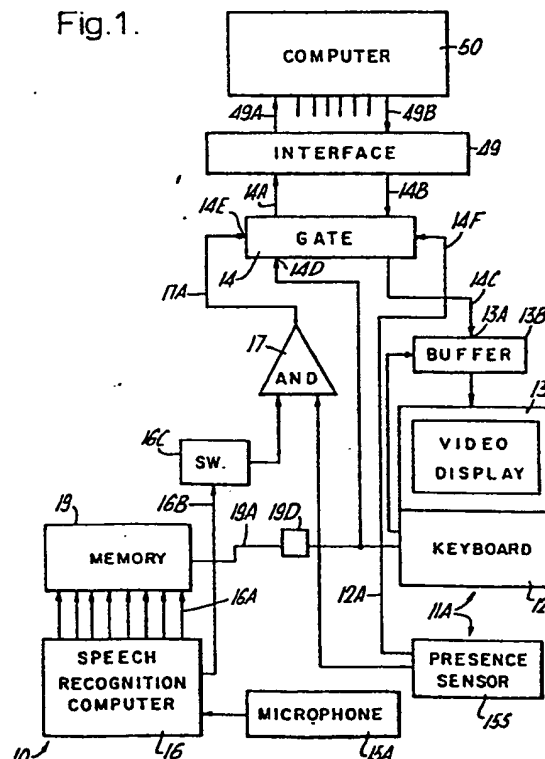
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(54) Computer security systems.

(57) A system and method are provided for enabling and recording operations relating to computers and computer peripheral equipment wherein sensitive or secret data is to be entered and stored or processed and data of a similar nature is accessible from a memory or calculating circuits. In particular, the invention involves electronic means 16 for sensing or scanning one or more physical characteristics of a person or persons about to enter and/or receive data from a computer 50 and generating signals indicative of such physical characteristic(s) which signals are automatically analyzed and compared with signals stored in a memory 19 to generate enabling signals for enabling the operation of the computer. In addition, a code signal or signals are generated which is used to identify the person entering and receiving data from the computer 50, which code signal is recorded for record purposes along with information indicative of the information entered and/or received from the computer. Such information may be provided on-line at a monitor station remote from a data entry and retrieval station or readily available from memory for routine analysis during auditing or investigation of error or fraud. In a particular form of the invention, both the presence of a person at a computer terminal and an identifying characteristic of such person are sensed and used to enable the entry and retrieval of data.

Fig.1.



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DESCRIPTION

This invention relates to a system and method for improving the operation of computers and computing systems, particularly with respect to the security and confidentiality of information contained and entered therein.

A number of major problems exist in the operation of computers and computing systems. One of such problems involves the unauthorized attainment of data from the computer or computing system. Another problem is involved with the entry of data into a computer or memory associated with a computing system, which data is either incorrect due to an operators error or is false as a result of an attempt to commit fraud and falsify records.

The instant invention is concerned with a computer system in which fraud is substantially reduced or, if permitted may be easily detected as to its source. The system also provides for means for assuring that confidential data stored therein is available only to persons authorized to view or receive same.

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A primary feature of the instant invention involves the identification of all persons who enter data into a computer and preferably, although not necessarily, all persons who receive data from the computer or, in a specialized form, all persons who receive confidential data from the computer. Such identification may be effected in a number of manners including the automatic electronic recognition of a particular feature of the person about to enter or receive data with respect to the computer or computer memory. Such recognition may be effected by the electronic analysis of a person's voice signals generated when the person speaks into a microphone, the automatic electro-optical scanning of a person's fingerprint presented by the person to a scanning location, the automatic electro-optical or otherwise effected scanning of the dimensions of a person's hand including the fingers thereof, the electro-optical scanning of a person's face from one or more directions or the scanning of any other body feature of the person wherein the analog signals derived from said scanning are digitized and are compared with signals derived from a memory which were originally recorded in such memory from signals derived in similar scans of the same person. Such identification results in the generation of a code signal, preferably from the computer memory, which is recorded in a temporary storage device such as on a magnetic disc or in

an electronic memory, and the reproduction of such code signals from such storage device each time an entry is made by the operator into the computer or data is received from the computer or together with the information so recorded and/or a code signal or signals representative of the memory derived from the computer. The enabling signal or control which permits data to be received or entered may be periodically updated or refreshed in accordance with periodic checks of the identification of the person entering the data which may be randomly or periodically indicated by a warning device requiring same or a sensing device which senses when such person leaves the vicinity of the terminal at which data is entered or requested.

In another form of the invention, data may be entered or requested by a person speaking words into a microphone at the computer terminal or remote therefrom and connected to the computer terminal by short wave or telephone lines, wherein the voice signals of the person entering or requesting the data are automatically analyzed by the computer for identifying such person and generating an enabling signal as well as the identification code signal which is recorded along with signals indicative of the information derived from and/or entered into

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the computer. Such automatic analysis may occur as the person speaks words indicative of information requested or to be answered.

In a particular form of the invention, two or more of the aforescribed personal identification techniques may be employed and required for the entry or attainment of data or of specific data in the computer.

Accordingly, it is a primary object of this invention to provide a new and improved system and method for operating a computer or computing system.

Another object is to provide a system and method for operating a computer or computing system wherein identification of persons having access thereto and entering or receiving data with respect to the computer or its memory, is ascertained.

Another object is to provide a computer or computing system in which persons entering data into the system are identified and all transactions, including data entered and received, are identified and recorded as to the identification of the person partaking in such transactions.

Another object is to provide a computing system in which fraud in the entry of data is greatly reduced.

Another object is to provide a computer system in which confidential data stored in or retrieved from a computer, is not available to any but authorized persons.

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Another object is to provide a computer system in which data is both entered and retrieved from the computer or its memory by the automatic analysis of speech signals generated by a person speaking into a microphone which analysis results in identification of such person and the generation of a code which is applied as a recording to indicate the information derived from and entered into the computer, for record keeping purposes.

Another object is to provide a computer security system in which the presence of a person is sensed at a terminal and the person is identified by sensing a physical characteristic of such person or by the person entering a code into the computer or auxiliary equipment wherein, if such person should leave the vicinity of the terminal, another person will not be able to operate the computer without further identification of such other person.

Another object is to provide a computer security system in which a record is made of the identity of all persons operating the computer and the information entered and received from the computer, whereby the source of data entered into the computer and retrieved therefrom may be identified for auditing purposes and control.

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Another object is to provide a computer security system in which signals are recorded which positively identify persons who operate a computer or peripheral together with an indication of time of operation of the computer and information transferred.

With the above and such other objects in view as may hereinafter more fully appear, the invention consists of the novel constructions, combinations and arrangements of parts and method as will be more fully described and illustrated in the accompanying drawings, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

FIG. 1 is a schematic diagram showing features of the broad computer security and control system defining the instant invention; and

FIG. 2 is a more detailed schematic diagram of the computer security system defining the instant invention.

In FIG. 1 is shown broad aspects of a data terminal 11A forming part of a data processing system 10 which includes a computer 50 and one or more of such terminals which may time share the computer 50 through interface 49 such as a time sharing multiplexing system. The terminal 11A includes a coded keyboard 12 having an output 12A extending to a control gate or switch 14, which itself contains an output 14A extending to the interface

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or multiplexing device 49. The latter interface 49 contains one or more outputs 49A extending to the input or inputs of the computer 50 while the computer 50 contains one or more outputs 49B extending to the interface 49 which itself contains a plurality of outputs one of which 14B extends to the gate 14 and an output 14C from such gate extends to the input 13A of a memory or buffer 13B for an image writing display 13 which may comprise a conventional display cathode ray tube. Unless gate 14, which may contain one or more switches for enabling information to be transmitted from the coded keyboard 12 to the interface 49 and a computer 50 and from the computer 50 to the memory or buffer 13B for the cathode ray tube 13, ^{is closed} such functions relating to the computer 50 as data input thereto, data retrieved therefrom and programming of the computer may not be performed.

In order to enable the operation of the computer 50 from the terminal 11A, an operator sitting at the coded keyboard 12 must properly activate one or more sensors, at least one of which is a sensor of a physical characteristic of the operator such as a microphone or other device. In FIG. 1, a microphone 15A is provided at the terminal, preferably although not necessarily, attached to the frame supporting the coded keyboard 12 and the cathode ray tube display 13 and at a location such that a person sitting at such keyboard may speak selected words into the microphone so that analog audio signals will be generated on the

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output thereof which extends to a computer or speech recognition processor 16 of conventional design.

The speech recognition processor computer 16 is operable to process or digitize the analog speech signals generated on the output of the microphone 15A and automatically analyze same by comparing the results with signals generated from a memory in the processor. When the signals so analyzed match or otherwise compare with signals reproduced from the memory of the processor, which memory contains recordings or speech information from one or more persons authorized to operate the computer 50, a first signal is generated on one of a plurality of outputs 16A of the processor 16 and is applied to a particular circuit of a multiple input storage device 19 containing codes associated with different persons authorized to use the computer 50. Depending upon which of the outputs 16A of the processor 16 is activated, one of the codes stored in the storage device 19 is generated on its output 19A and is passed to the input 14D of the gate 14. When gate 14 is properly operated and closed, such code is passed to the computer 50 through the interface 49 and is recorded in the memory of the computer together with an indication of the time and date of such recording, as generated by either an internal clock associated with the computer circuits or an external clock connected to the computer. An indication of the information transmitted to the computer 50 from the coded keyboard 12 and

received from the computer and displayed on the display screen of a cathode ray tube 13, is recorded in a special section of the memory of the computer 50 or an auxiliary memory located within or external of the computer so that an identification of the person operating the computer, the information such person enters into the computer and the information received from the computer as well as the date and time of day such information is generated or received, is had for future reference.

Gate 14, which is normally open and thereby prevents the transmission of information to or from the computer with respect to the terminal 11A, will close to pass information in both directions when the speech recognition processor-computer 16 recognizes the speech signals received as those generated by a person authorized to use the computer and generates, in addition to a signal on one of the outputs 16A for generating the described code identifying the person, a control signal on another output 16B which activates a bi-stable switch or relay 16C, the output of which energizes one input of a logical AND circuit 17 which is maintained energized either for the duration of the time the computer is used by the person at the terminal or until a sensor at the terminal senses the movement of such person away from the terminal. Such sensor, denoted 15S in FIG. 1, may comprise a limit switch supported within the seat or cushion of the terminal, the output 15SA of which extends to the other input of the AND

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circuit 17, thereby generating an output signal on the output 17A of the AND circuit 17, which output extends to the switching input 14E of the gate 14. When so energized, gate 14 closes thereby allowing information thereafter to be passed from the coded keyboard 12 to the computer and also allowing the code generated on the output of the code generator 19, which is temporarily delayed in a delay element or relay 19D, to be passed to the computer. Also, when gate 14 is closed as described, information generated by the computer from its memory or from calculations performed thereby, may pass through such gate to the input 13A of the buffer 13B for the cathode ray tube display 13 and to be thereby generated as a still image of lines of alpha-numeric characters or other information generated by the computer 50.

Should the person sitting at the terminal 11A leave the vicinity of the terminal, the presence sensor 15S becomes deactivated causing the output of the AND circuit 17 to be terminated, and a control such as a logical NOT circuit or other contacts of the presence sensor switch to become closed or activated so as to signal the microprocessor or computer 16 or directly an input 14F of the switch control/the switch or gate 14 to open/so that, should another person try to operate the terminal, such operation will not be possible until such other person is identified and properly positioned at the terminal as described.

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Identification of the person seeking to use the computer 50 may be effected in a number of manners as described and also be such person selectively operating switches of the keyboard 12 to generate a selected code or codes known only to such person or a limited number of persons, which code or codes may be directly applied to close gate 14 or may be utilized to operate an auxilliary control means such as a coded relay or circuit for generating a signal on an input to the AND circuit 17 or other logical circuit receiving a signal, for example, from a presence sensor such as sensor 15S. If the gate 14 is a bistable switch, it may be automatically caused to open when it receives a signal generated, for example, when the person operating the terminal, leaves the terminal as sensed by sensor 15S.

Memory 19 may also comprise an EPROM (erasible programmable read only memory) forming part of the speech signal recognition computer 16 and operable to generate a code identifying the person whose speech signals are recognized by such computer which code signal may be passed therefrom either directly to the computer 50 for recording therein along with signals indicative of the information entered into the computer 50 by the selective operation of the keyboard or other means and of any information derived from the computer 50 or such identifying code may be stored in an auxilliary memory such as another EPROM to be read therefrom whenever the keyboard 12 is operated thereafter and/or whenever queried by signals from the computer which may be programmed to identify sensitive information.

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FIG. 2 shows greater details of a system 10A which is a modified form of system 10 of FIG. 1 and is operable for assuring computer operating security. Whereas in FIG. 1 a number of subsystems and discreet components are employed to enable the transmission of information to a computer and the reception and display of information generated by the computer, in FIG. 2 a microprocessor or microcomputer 20 is employed, which is programmed to control the transmission of data to and from a plurality of data storage and analyzing devices, the combination of which are operable to assure computer data security. by identifying the person attempting to operate the terminal and input data into a local or remote computer which may be time shared with other terminals and receive data from such remote computer. Means are also provided for generating a code associated with the person so identified and recording such code either locally in a memory or within the memory of the computer along with information identifying the data transmitted to the computer and received from the computer so that if it^{is} necessary to indicate who of the persons authorized to operate the terminal entered specific data in the computer memory and received specific data therefrom, such function may be performed at one or more terminals of the system or at a central terminal or monitor station which may be located near the computer.

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The computer 50 may comprise a data processing computer, image or document information storage and retrieval computer, scientific information storage and retrieval computer or any type of computer which is operable to receive and/or disseminate information of a sensitive nature. One or more input and output lines 50A and 50B extend to the computer for the transmission of data thereto from one or more terminals and the reception of data stored in the memory of the computer or generated by its computing circuits. A monitor station 50M is provided having a television display, such as a cathode ray tube 50D which is driven and the display thereof maintained by a buffer 50C which includes a decoder-driver and refresh memory. A manually operable keyboard 50K is also provided at the monitor station for two-way communication with the computer and, although not illustrated, control means of the type which will be described to assure computer security at the terminals which communicate with the computer 50, may also be provided at the monitor station 50M.

An alarm 50E located at the monitor station 50M, which may be part of or attached to the video display 50D or keyboard 50K, is operable to alert a person at the monitor station of certain conditions which may exist at one or more of the terminals which are operable to communicate with the computer 50, enter data therein and receive data therefrom. Such a remote condition

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as an aborted attempt to communicate with the computer, a number of such attempts, the presence of a person at any of the terminals or the removal of such persons from a terminal, may be initially indicated by operation of the alarm 50E when its driver 50F is activated by a signal from the computer 50 and further details thereof may be derived by information transmitted from the computer 50 to the display 50D.

From multiple terminal operation, an input-output interface 49, as described, connects the circuits 50A and 50B to computer 50 directly with an output 14F of control microprocessor or computer 20 and an output ^{49A} thereof to a transmission gate 14G the output of which extends to microprocessor 20. Microprocessor 20 is clocked by signals from an oscillator 22 having an attendant feedback circuit 22E for stability.

The microprocessor 20 receives signals from a plurality of inputs including:

[a] a manual keyboard 12 with which the operator of the terminal may enter data into the computer 20 and by means of which the operator may receive data therefrom, such as data stored in the memory of the computer, an auxiliary memory controlled by the computer or data defining the results of computations performed by the computer.

To verify that the person sitting at the terminal is authorized to enter data into the computer and to receive data from the computer and permit such entry and retrieval and, further,

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to record such transactions and operations including the identification of the person at the computer terminal who is communicating with the computer and the date of such communications, the following input and output devices are employed per se or in combination:

[b] A microphone 23 is disposed convenient to the operator of the keyboard 12, such as integral therewith or adjacent thereto. To identify the operator, selected words are spoken by the operator into the microphone 23 and are amplified by an amplifier 23A, the output of which extends to an automatic voice-print analyzing circuit 24 and a speech recognition computer 27, both of which have respective variable input devices such as pluggable memories 25 and 28 which are preferably locked and secured in a housing, such as the terminal housing, and may be changed with the changing of personnel who are authorized to use the computer at the terminal 11A. An interface 26 receives the signal output of the analyzing circuit 24 and a second interface 29 receives the signals output from the speech processor 27, inputting such signals to the microprocessor 20 on respective circuits, for use thereby in comparing such outputs with signals derived from the voice-print memory 25 and the speech pattern memory 28. The computer and microprocessor 20 automatically determine: if the person at the terminal, who is speaking the selected words into the microphone, is actually a person authorized to use the computer 50 from the analysis which includes

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signals transmitted by the microprocessor to a code comparator 30. Upon positive identification of such person at the terminal by the analysis of the signals output by the microprocessor 20, a switching signal is generated and transmitted from the microprocessor to the transmission gate 14G which is controlled thereby to close and thereby permit the transmission of signals output by the interface from the computer 50 to the microprocessor, when received, which signals may be used to activate respective drives 31, 33, 35 and 37 for a plurality of circuits. Drive 31 is operable for controlling display functions of a video display 13, which may be a cathode ray tube of the type described, adjacent or attached to a keyboard 12. Drives 33 and 35 are operable to respectively drive a hard copy printer 34 and a facsimile signal transmitter 36. Drive 37 receives control signals for a synthetic speech signal generator 38 from the microprocessor 20 which generator generates speech signals of words defining information received from the computer 50, which signals are converted from digital form as received, to analog form in a digital-to-analog converter 38D, the output of which is connected to a speaker 39 for generating sounds of words indicating the data generated for the person at the terminal 11A to hear. A control

38C, preferably forming part of the keyboard 12, may be employed by the operator of the terminal to effect repeated reproduction of signals generated by the signal generator 38 and the regeneration of the same words on the output of the speaker 39 in the event that the operator requires such repeat to intelligibly determine the nature of the information so generated. In addition to generating sounds of words defining information requested by the operator of the keyboard 12, instructions and commands generated by the central computer 50 associated with the operation of the keyboard 12 and other variables, may also be transmitted to pre-determinately operate the speech signal generator 38 and generate specific words on the output of the speaker for facilitating system operations.

A television camera 40, under control of signals generated on respective outputs of the microprocessor 20, is also employed to scan the face of the operator of the terminal 11A and/or to scan document information to be processed and entered into the memory of the computer 50 as one or more full-frame video signals generated on the output 40A of the camera. Such analog video signals are converted to digital form in an analog-to-digital converter 41 and passed to the microprocessor 20 for storage in its video image memory 46 and/or for transmission to the computer 50 on an output extending to the interface 49A, to

be entered in the memory of the computer for identifying the operator of the terminal in an on-line manner for use in activating the display 50 D to permit an operator of the monitor station 50 M to view and identify an image of the face of the person at the terminal. Such video image signal or signals generated on the output of the camera 40 may be stored in the memory of the computer 50 together with signals or codes which are indicative of the time of day and the information transmitted to and received from the computer by means which will be described.

To maintain images on the image screen of the cathode ray tube of the video display 13 of the terminal 11A, a buffer memory 47, such as a magnetic disc or high density storage EPROM has input and output lines extending to and from the microprocessor 20. Display generating video signals derived from the computer 50, the video camera 40, the microprocessor 20 or generated by the selective operation of the keyboard 12, are input to the buffer memory 47 and temporarily stored therein for cyclically refreshing the display screen of the video terminal display 13. A character generating memory 32 receives signals from the microprocessor 20 through a decoder driver 31 as originally generated

by the computer 50 or the selected operation of the keyboard 12 and provided by a key code memory 62 connected to the microprocessor 20. Such memory 62 may also be integral with the encoded keyboard 12 and may be utilized to generate a code or codes in accordance with signals received from the microprocessor 20 and generated by means other than the encoded keyboard 12.

Control of the write-beam of the cathode ray tube of the display 13 is effected, when needed, by signals generated as reproduced from part of the buffer-storage memory 47 which also generates deflection control digital signals for controlling operation of the scanning movement of the read-beam of the television camera 42, which signals are transmitted through the microprocessor to respective digital-to-analog converters 44 and 45 which are respectively connected to the horizontal and vertical sweep controls 42 and 43 of the camera 20.

Additional means as described are employed to identify the person at the terminal 11A who is seeking to operate the computer 50. Such additional means may be optionally provided in accordance with the degree and nature of the security required of the system and include a normally open limit switch 51 which may be closed by the weight of a person sitting at the computer terminal or standing on a pad adjacent the display 13. The output of limit switch 51 is connected to a debounce circuit 52 to the microprocessor 20 and receives electrical energy, converted to a

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suitable voltage by conventional means, from a source of line current or power supply employed to provide such electrical energy for energizing the other components and subsystems illustrated.

An ultrasonically operated sensor 53 for sensing the presence of a person at the terminal 11A generates an output signal upon effecting such sensing, which signal is transmitted through an interface 54 to the microprocessor 20.

A second ultrasonic sensor 55 may be utilized to sense changes in the environment of the terminal 11A, such as the presence of one or more additional persons thereat who may be able to receive and discriminate information generated by the video display 13, the printer 34, the facsimile machine 36 or the speech signal generator 38. The output of sensor 55 is transmitted to the microprocessor 20 through an interface 56 and may be utilized to open the transmission gate 14G, activate the alarm 50E or a separate alarm at the terminal 11A, effect the generation of speech signals on the output of a speech signal generator 38 which are indicative of such condition and warn the persons at the terminal that the computer may not be operated until the additional person or persons leave the vicinity of the terminal or effect their identification.

Still further identification of a person or persons at the terminal 11A may be effected by means of a fingerprint reader 57 of conventional design which includes electro-optical means for scanning the fingerprint of a person or persons presented to a scanning location and generating digital signals indicative of the fingerprint at an interface 58 which is connected to the microprocessor 20. A fingerprint signal containing memory 59 is also connected to the microprocessor 20 and when queried by a signal therefrom, transmits signals reproduced from its memory to the microprocessor, which signals are compared in a comparison circuit of the code comparator 30 or a fingerprint signal recognition processor forming part of the memory of the microprocessor 20 or connected thereto.

It is noted that one or more of the described personal identification and indicating means connected to the microprocessor 20, may be utilized in a particular computer security system depending upon the particular requirements for security.

A combination of the personal presence sensor or limit switch 51 and any of the described voice print analyzing, speech recognition, ultrasonic operator and environmental sensors, fingerprint scanner or any other sensing or scanning device which is operable to generate identification signals upon sensing a physical characteristic of the person at the terminal, may be utilized to generate information signals to be input to the microprocessor 20.

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and analyzed by circuits thereof or the circuits of one or more peripheral devices to permit the microprocessor to control the transmission gate, the display, printer and facsimile transmitter of information, the speech signal generator to generate speech indications of all or part of the information received from the computer 50 or local information generating devices.

Notation 60 refers to an operational program memory having input and output circuits connected to the microprocessor 20 for controlling its operation. An additional memory 61 is also provided for generating code signals such as codes identifying different persons authorized to operate the computer 50 from the terminal 11A, and may be queried by signals from the microprocessor 20 to generate a code identifying such person, whenever required, which code may be recorded in a memory of the microprocessor, transmitted to a separate local memory or to the central computer 50 to be recorded in its memory adjacent signals which indicate the information transmitted to the computer by such operator and transmitted from the computer to the terminal 11A for activating the display 13, the printer 34, the facsimile machine 36 and/or the speech signal generator 38 as described. A clock signal generator 66 is also provided connected to the microprocessor, which generates time code signals which may be gated through the microprocessor to the central computer 50 together with the code signals derived from memory 61 and indicative of the identification of the operator of the terminal 11A

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so that both personal identification and time code signals are available for recording in a computer memory together with codes indicative of the information transmitted to and received from the computer by the terminal 11A. Such information may be derived from the memory of the computer 50 and displayed on the display 50D thereof or utilized to operate a hard copy printer 60P at the monitor station 50M to make it readily available to a person or persons monitoring the information entered into the computer and derived therefrom by any of a plurality of monitor stations and to determine at any time what information has been entered into the computer 50 and received therefrom, the time of such entry on reception and the person entering or receiving the information. Signals generated by the microprocessor 20 and transmitted to the computer 50, may also be indicative of the operation of the printer 34, the facsimile machine 36 and the speech signal generator 38, which systems may be selectively controlled in their operation by the selective operation of the keyboard 12. The coded keys of the keyboard 12 which are operated to selectively transmit information from the computer to the printer 34, the facsimile machine 36 and the speech signal generator 38 may also be operable to provide control signals for controlling the microprocessor 20 to transmit code signals to the computer 50 which are indicative of the operation of such peripheral devices and which may be recorded in the memory of the computer together with the code signals identifying the person operating the terminal.

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Also provided at the terminal 11A and connected to receive speech signals generated by the microphone 23 when a switch 23S is manually closed, is a speech signal synthesizing and recognition circuit 63 which is operable to identify specific words spoken into the microphone, such as verbal commands for predeterminately generating data to be entered into the computer 50 and controlling the operation of such computer from the terminal 11A as described. In other words, the speech analyzing circuits of the speech analyzing computer 63 may be used as an auxiliary means for entering data defined by words defining numbers and other speech spoken into the microphone 23 and for receiving selected information from the computer with or without the selective operation of the keys of the keyboard 12.

The terminal video display or cathode ray tube receiver 13 may be operated by signals from the decoder driver 31 which receives video signals from the character generator 32 which is activated by signals from the microprocessor 20 and by video signals derived by converting the video digital signals received from the buffer storage memory 47 and gated to a digital-to-analog converter 64 which is connected to a video deflection and intensity control circuits associated with the CRT 13.

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The speech signal analyzing computer 63 and the speech recognition processor 27 may be made in accordance with speech recognition devices and systems produced by such companies as Threshold Technology Inc. of Delran, New Jersey; Dialog Systems Inc. of Belmont, Massachusetts; Scott Instruments. Denton, Texas or others, it being noted that the electronic subsystems denoted 24, 25, 27 and 28 may form a single speech synthesizing and analysis computer obtainable from one of such companies. The speech signal generator computer 38 may be derivable from or obtain components manufactured by such companies as Texas Instruments Corporation, Dallas, Texas using their TNC 0820 or other speech synthesizing circuits or speech synthesizers and speech generating computers manufactured by such companies as Telesensory Systems Inc of Palo Alto, California; Votrax Division, Federal Screw Works, Troy Michigan; Periphonics, Bohemia, New York; Interstate Electronics, Anaheim, California and others. The synthetic speech processor 27 and analyzer 24, for example, may comprise the Threshold 500 voice recognition computer or the like.

It is noted that the described data security system or a part thereof may be utilized as a guard against theft or improper operation of other forms of accounting machines such as cash registers and other cash or article dispensing machines. For example, personal and presence identification means as described in combination with a computer or microprocessor and electronic circuit elements and subsystems as described may be employed to

permit or enable the operation of a cash register or the like wherein transactions performed are recorded in a memory such as a microprocessor memory or on a record member which is not dispensed to a customer together with a code associated with the operator of the cash register wherein such code may be generated by any of the means described used per se or in combination. Such a personal identification code, for example, may be generated when the user of the cash register depresses or activates a push-button switch wherein the finger causing such switch activation is photoelectrically scanned and the resulting signals are processed to generate the code and, in certain instances, analyzed to enable operation of the register. If the code identifying the person operating the register is recorded with each transaction wherein the latter includes the amount of the transaction, then errors which are thereafter detected may be attributed to the person or persons using the cash register. A microphone and electronic circuits as described for analyzing voice signals of words spoken by a person using the register may also be employed to generate user identifying codes and enable operation of the register.

It should be understood with respect to all of the embodiments illustrated and described above that power supplies having the correct polarities and magnitudes are provided, where not indicated in the drawings, so as to supply proper electrical energy for appropriately operating the various illustrated circuits as described in the specification and in a manner to properly perform the functions described.

CLAIMS

1. A computer security system comprising:

(a) first means including a computer and a keyboard operable for entering data into said computer and for obtaining data from said computer,

(b) second means for identifying persons seeking to enter data into said computer and obtain data from said computer, said-second means including at least one transducer for sensing at least one personal characteristic of a person at said keyboard,

(c) third means operable when said second means identifies a person for generating a code defined by electrical signals indicative of the person identified,

(d) fourth means for receiving and recording said electrical signals,

(e) fifth means connected to said second means for enabling the entry of data into said computer when said second means properly identifies a person seeking to enter data, and

(f) sixth means connected said second means for enabling the obtaining of data from said computer when said second means properly identifies the person seeking to obtain such data.

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2. A system in accordance with Claim 1 wherein said second means includes means for generating electrical signals representative of the characteristic of the person sensed, means for processing the electrical signals so generated and generating signals defining the characteristic sensed, a memory containing recordings defining physical characteristics of a plurality of persons authorized to have access to said computer and comparator means for comparing said signals with signals recorded in said memory means for generating a control signal when a proper comparison is made and means responsive to said control signal for generating said code.

3. A system in accordance with Claim 1 wherein said second means is part of said computer.

4. A system in accordance with Claim 1 wherein said second, third and fourth means are part of said computer.

5. A system in accordance with Claim 1 wherein said second means includes a microphone in the vicinity of said keyboard into which microphone the person to be identified may speak selected words and which microphone is operable to generate output electrical speech signals of the speech sounds spoken therein, and means for processing and analyzing such speech signals for identifying the person and generating said code.

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6. A system in accordance with Claim 1 including means for recording said code generated by said third means along with data entered by the person identified into said computer for permitting future identification of the person and the information entered by said person.

7. A system in accordance with Claim 6 including a buffer circuit for receiving and recording said code generated by said third means and means for generating said code from said buffer circuit each time the person identified to generate said code enters data into said computer.

8. A system in accordance with Claim 6 including a buffer circuit for receiving and recording said code generated by said third means and means for reproducing said code from said buffer circuit each time the person is identified to generate said code receives data from said computer.

9. A system in accordance with Claim 1 including a recording means for data entered into said computer and means for recording the code generated by said third means in said latter recording means along with data generated by a person identified by said code to provide said code recording as an indication of the data entered into said computer and the person effecting the entry of said data.

10. A system in accordance with Claim 9 including means for generating time and date indicating codes and means for recording said time and date indicating codes along with the code generated by said third means and an indication of the data entered into said computer so as to indicate when such recordings

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are reproduced the person entering the data, time of entry and the data entered into said computer.

11. A system in accordance with Claim 9 including a means for generating voice signals of a person at said keyboard and means for recording said voice signals along with the code generated by said third means to provide further identification of the person entering and retrieving data with respect to said computer.

12. A system in accordance with Claim 1 including means for sensing the presence of a person at said keyboard and generating a signal when said person leaves the vicinity of said keyboard and means responsive to said latter signal for deactivating said sixth means to enable the generation of further information by said computer only when said second means identifies a person who is in an operating position at said keyboard.

13. A system in accordance with Claim 12 including means for sensing a number of persons in the vicinity of said first means, means for identifying each of said persons and generating a control signal upon failure to identify said number of persons and means for applying said latter control signal to prevent the operation of said sixth means in enabling the obtaining of data from said computer.

14. A system in accordance with Claim 12 wherein said first means defines a data terminal with a seat for the person operating same and said sensing means comprises a switch which is operable when a person is sitting in said seat.

15. A system in accordance with Claim 12 wherein said person sensing means includes radiation receiving means operable when a person is at said keyboard.

16. A system in accordance with Claim 12 wherein said person sensing means includes an ultrasonic sensor operable to sense the presence of a person at said keyboard.

17. A method of recording and reproducing information relative to a memory of a computer comprising:

identifying a person seeking to enter information into a computer and to derive information from such computer by sensing a physical characteristic of such person and generating electrical signals indicative of such physical characteristic, and person identified,

processing said electrical signals and comparing same with signals generated from a memory which latter signals are derived from scanning the same physical characteristics of the same person sensed to identify said person,

generating a control signal when signals generated by said memory match the signals generated in scanning the physical characteristics of the person seeking information and applying said control signal to activate an enabling means for enabling

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the person whose physical characteristics are sensed to enter information into said computer and to derive information from said computer, and

also generating a code identifying the person whose physical characteristics are scanned and recording said code in a memory when information is entered into or derived from said computer in a manner to permit identification of the person entering or deriving the information from the computer and identification of the information so entered or derived therefrom.

18. A method in accordance with Claim 17 wherein recordings of said code and the recording is indicative of the information entered into the computer and derived therefrom are effected in a manner to indicate the identity of the person entering information or deriving information from said computer when such recordings are reproduced from said memory.

19. A method in accordance with Claim 19 including generating further code signals indicative of the time and date on which the information is entered into the computer and derived therefrom.

20. A method in accordance with Claim 17 wherein the physical characteristics of the person seeking to enter information into and receive information from said computer comprises signals generated from voice sounds of words of the person spoken into a microphone, said method including digitizing the analog signal output of said microphone, processing the digitized signals and generating code signals thereof for

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comparison with signals generated from said memory to identify the person and generate said control signal.

21. A method of detecting fraud in the operation of a computer system comprising:

identifying all the operators authorized to operate an electronic computer system having a plurality of data entry and display terminals and,

whenever data is entered into said system, generating a code which is unique to the person entering the data and recording said code along with signals indicative of the information entered, and

when it is desired to determine the identification of the person entering specific information into the computer system, reproducing the signals indicative of the specific information to be audited along with the code of the person entering said information, and

applying said code signal to activate a visual presentation means to cause the visual presentation means to present visually readable information indicating the identity of the person associated with such code.

22. A method in accordance with Claim 21 including electronically auditing the information entered into said computing system to determine errors therein and, when an error is detected, generating a control signal and applying said control signal to effect the reproduction of a recorded code

indicative of the person who entered the erroneous information into the system.

23. A method in accordance with Claim 22 including applying said reproduced code to activate a display for displaying the identification of the person who entered the erroneous information into the system.

24. A method in accordance with Claim 21 wherein the code signal unique to the operator who enters data into the system is generated by electronically detecting such operator, and generating detection signals, comparing such detection signals with signals generated by reproducing code signals of a plurality of persons authorized to enter data into the computer and, when a match occurs between said detection signal and generating said code identification signals.

25. A method in accordance with Claim 24 wherein the step of electronically detecting and identifying the person entering data into the system is effected by automatically analyzing signals derived from that person speaking into a microphone.

26. A method in accordance with Claim 25 wherein the speech signals generated by the person to be identified are generated from specific words spoken into a microphone by said person.

27. A method in accordance with Claim 24 wherein said automatic identification of the person to be identified is effected by electro-optically scanning an image of the face of said person and generating a video signal derived from such scanning, automatically processing said video signal by digitizing same and comparing the results of such processing with signals reproduced from a memory which latter signals are derived from video scanning images of the faces of all persons authorized to enter data into said system.

28. A method in accordance with Claim 21 which includes identifying the person seeking to enter data into said system by electronically analyzing speech signals generated by such person speaking into a microphone and, upon such identification, generating an enabling signal to enable such person to enter data into said system.

29. A computer security system comprising in combination:
first means including a computer and a computer terminal for communicating with said computer and including input means for permitting an operator at said terminal to operate said computer, enter data therein and obtain data therefrom,

second means for identifying persons seeking to operate said computer from said terminal and seeking to enter information into said computer and obtain data therefrom, said second means including a television camera for scanning the face of a person at said terminal,

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said second means including means for generating enabling signals for permitting a person at said terminal to enter data into said computer and obtain selected data from said computer,

means for controlling said television camera to effect a full frame scan of the face of a person at said terminal when said person attempts to operate said computer and to generate a full frame video signal containing the image of the face of said person on its output,

recording means for recording information output by said television camera,

means for generating a first code identifying a person at said terminal seeking to operate said computer from said terminal, and

means for recording said first code together with a full-frame video signal derived from said television camera in said recording means to provide recordings of persons operating said computer from said terminal which recordings define respective code and video signals derived from both identifying persons at said terminal and scanning their facial images, and

display means for displaying characters defining codes identifying persons and images of the faces of persons scanned by said television camera to permit monitoring of persons who have operated said computer from said terminal.

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30. A computer security system in accordance with Claim 29 wherein said television camera is operable to generate an analog video signal output and means for processing analog signals output by said television camera to generate digital video signals and means for recording said digital video signals in said recording means.

31. A computer security system in accordance with Claim 29 including reproduction means for selectively reproducing full frame video picture signals from said recording means and display means operable to receive the selectively reproduced video signals and displaying images of the faces of persons scanned by said television camera together with data defined by said first code identifying each person whose facial image is displayed by said display means.

32. A computer security system in accordance with Claim 29 including means for generating a second code indicative of data obtained from said computer and means for recording said second code along with said first code to indicate and identify information derived from said computer and persons receiving such information from said computer.

33. A computer security system in accordance with Claim 29 including means for generating and recording time of day and date codes along with said first code identifying persons operating said computer and recording said time and date codes with said identifying codes in said recording means to serve as a record of the times and dates person operate said computer and the identity of persons using said computer.

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34. A computer security system in accordance with Claim 33 including means for generating codes indicative of data transferred with respect to said computer when it is operated and means for recording said latter codes along with said first code and the codes representing times and dates to provide recorded monitorable information relating to persons using said computer, the information transferred and the time and dates of transfer thereof.

35. A control and recording system associated with the operation of a data processing system comprising:

an electronic digital computer,

first means for entering data into said computer,

second means for enabling the operation of said first means

third means for automatically identifying a person seeking to operate said first means and generating a control signal upon effecting such identification and means for applying said control signal to said second means to enable operation of said computer,

said third means being also operable to generate a first code defining the identity of the person automatically identified thereby.

electronic memory means,

fourth means operable when an entry is made into said computer for recording said first code generated by said third means in said memory means.

36. A control system in accordance with Claim 35 including fifth means for generating a second code defining the data entered into said computer,

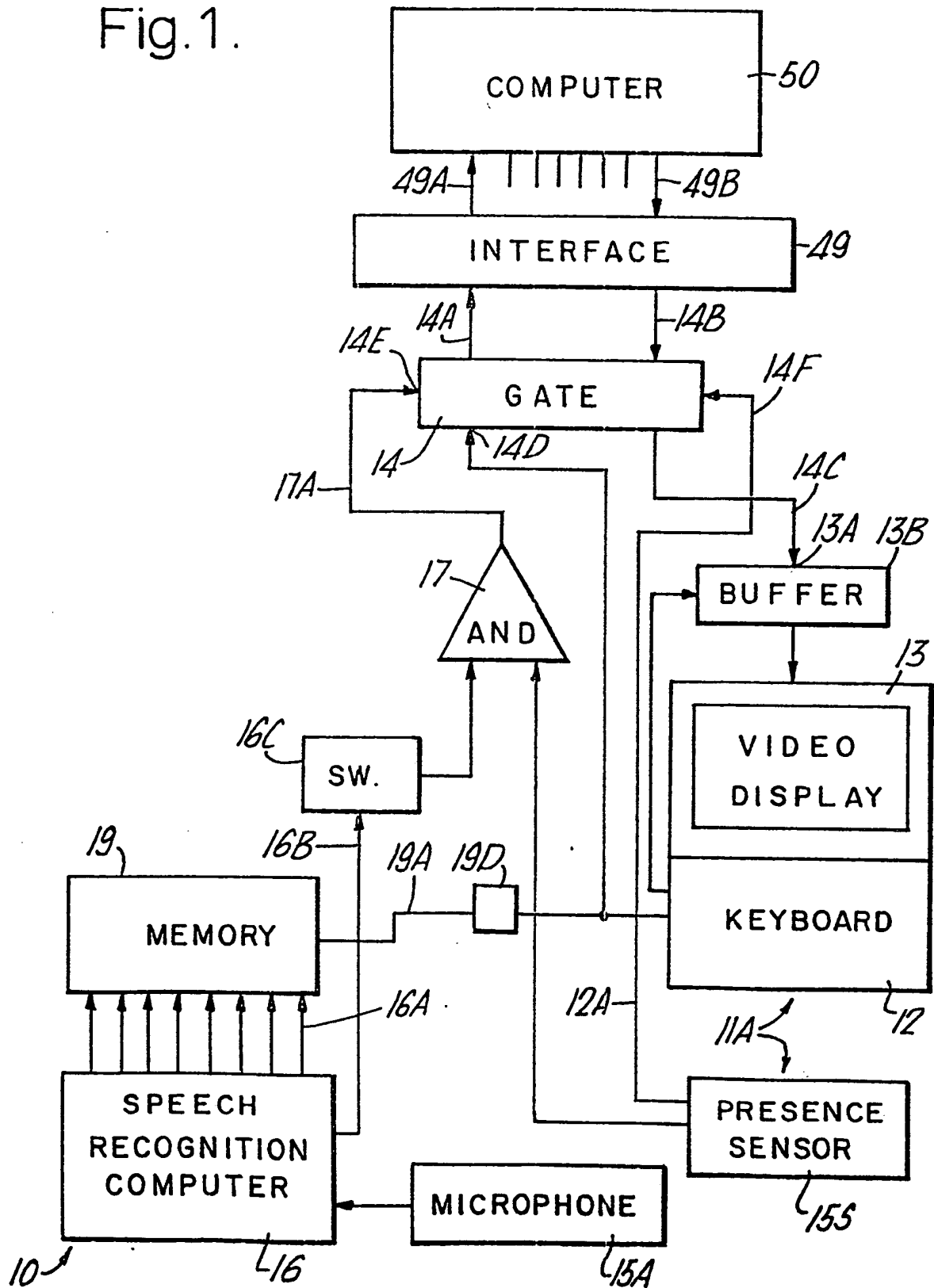
37. A control system in accordance with Claim 36 including a sixth means for generating a third code defining the data obtained from said computer,

38. A control system in accordance with Claim 37 including means for recording said second and third codes in said memory means,

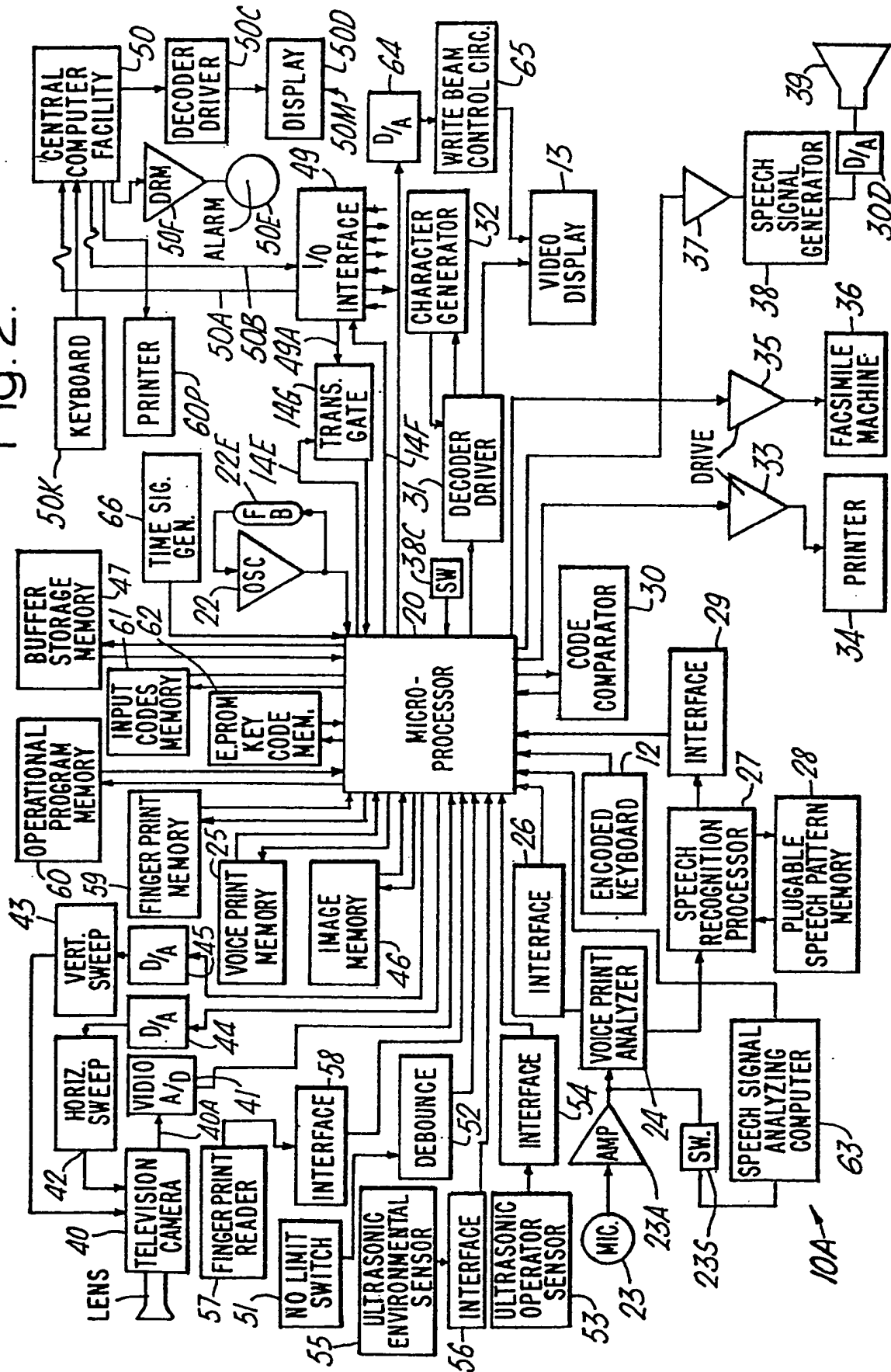
39. A control system in accordance with Claim 38 including means for selectively reproducing respective video signals of persons operating said computer and corresponding first and second codes recorded therewith in said memory means.

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Fig.1.



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EP 82 30 4605

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